RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) CORRECTIVE MEASURES STUDY

Former GM Facility Parking Lots COD-5, COD-6, and COD-7

July 2007

Prepared For:

City of Dayton
101 West Third Street
Dayton, Ohio

Prepared By:

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Restoring Resource Efficiency

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RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) CORRECTIVE MEASURES STUDY

CITY OF DAYTON PARKING LOTS (PARCELS COD-5, COD-6, AND COD-7) FORMERLY SERVING AS PARKING LOTS FOR THE ADJACENT GENERAL MOTORS FACILITY DAYTON, OHIO

REV. 0

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Department of Economic Development
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LIST OF ACRONYMS

AOC	Area of Concern
Bgs	below ground surface
BUSTR	Bureau of Underground Storage Tanks
CMS	Corrective Measures Study
COPC	Chemical of Potential Concern
EM	Electromagnetic
Ft^2	Square feet
Ft/ft	feet per foot
GM	General Motors
GPR	Ground Penetrating Radar
HQ	Hazard Quotient
ISUS	Improved Solutions for Urban Systems
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
MSL	mean sea level
ODNR	Ohio Department of Natural Resources
O&M	Operation and Maintenance
PCE	Tetrachloroethene
PRG	Preliminary Remediation Goal
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation Report
SLRE	Screening Level Risk Evaluation
SVE	Soil Vapor Extraction
TCE	Trichloroethene
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
Yd^3	Cubic yard

1. INTRODUCTION

Weston Solutions, Inc. (WESTON®) prepared this Corrective Measures Study (CMS) for three parking lots (Property) that served the former General Motors Delphi-Harrison Facility located at 300 Taylor Street in Dayton, Ohio (Figure 1-1). The CMS is a required part of the Voluntary Corrective Action Agreement (Agreement) between the United States Environmental Protection Agency (U.S. EPA) and the City of Dayton (City). WESTON prepared this study in accordance with requirements under the U.S. EPA Region 5 Brownfields program and the Resource Conservation and Recovery Act (RCRA) corrective action process. The former Delphi-Harrison Facility Identification Number is OHD 017 958 604.

1.1 PURPOSE

This CMS identifies, describes, and evaluates potential alternatives for the management and/or remediation of the chemicals of potential concern (COPCs) that have been identified at the Property. WESTON prepared this study using the information presented in the RCRA Facility Investigation Report (RFI) for the Property (WESTON, 2007).

1.2 BACKGROUND

The Property is owned by the City and is used for public parking. From 1950 to 1987, prior to ownership by the City, the Property served as parking lots for the adjacent Delphi-Harrison Thermal Systems Facility that was owned by General Motors (GM) Corporation. The Property parcels were associated with the following addresses:

- COD-5: 703 – 735 East Monument Avenue (odd numbers)
- COD-6: 803 – 841 East Monument Avenue (odd numbers)
- COD-7: 855 – 877 East Monument Avenue (odd numbers)

Prior to 1950, the COD-5 parcel was occupied by a millwright shop, a carpet cleaning business, a fan and motor company, a cooper shop (cask or barrel making), a machine shop, coal-pile storage, residential properties, and a restaurant.

Prior to 1950, the COD-6 parcel was occupied by a table manufacturing and wood storage facility, an upholstering supplies facility, an iron and metal company, a junk yard, a shoe repair shop, a grocery, a restaurant, and residential properties.

Prior to 1950, the COD-7 parcel was occupied by a cooper shop, a gas station, an appliance company, a screw machine products company, and residential properties. A gas station occupied the east part of the parcel during the period GM used the parcel for parking.

No records of past RCRA-regulated solid or hazardous waste treatment, storage, disposal areas, spills, fires, or releases on the Property were identified. Because of the historical presence of industrial occupants of the Property, and the possibility that hazardous or petroleum substances from those operations may have affected the Property, each parcel was defined as an Area of Concern (AOC). The AOCs are labeled as follows: Parcel COD-5 is AOC 1, Parcel COD-6 is AOC 2, and Parcel COD-7 is AOC 3.

Groundwater beneath the Property is identified as AOC 4. Chlorinated hydrocarbons are present in groundwater samples at concentrations exceeding National Maximum Contaminant Levels (MCLs). These constituents are well documented in numerous groundwater wells installed by GM in the immediate area surrounding the Property.

1.3 REPORT ORGANIZATION

The report is organized as follows:

- Section 2 – Description of Current Conditions
- Section 3 – Media Cleanup Standards
- Section 4 – Interim Measures Completed
- Section 5 – Identification and Development of Corrective Measures
- Section 6 – Recommendation for Final Corrective Measure Alternative
- Section 7 – References

2. DESCRIPTION OF CURRENT CONDITIONS

2.1 AREAS ADDRESSED

The Agreement between the City and U.S. EPA applies to seven parcels of land referenced sequentially as COD-1 through COD-7. This report is concerned with only those parcels that were included as part of the RFI: parcels COD-5, COD-6, and COD-7 (AOCs 1, 2, and 3, respectively). These three parcels served as parking lots for the adjacent former GM Delphi-Harrison Thermal Systems Facility. The objective of the RFI was to identify and define the nature and extent of releases of hazardous waste and hazardous constituents at and from the Property. Soil and groundwater samples were collected to investigate the AOCs. Figure 2-1 presents soil boring, sampling and groundwater monitoring well locations.

Figure 2-1 also shows the layout of the AOCs addressed as part of this CMS. The AOCs are laid out in an east-westerly configuration, bounded to the north by Pitts Street and to the south by East Monument Avenue.

- AOC 1 (1.3 acres), also known as Parcel COD-5, is the westernmost lot and is bounded to the west by Taylor Street and to the east by Meigs Street.
- AOC 2 (1.5 acres), also known as Parcel COD-6, is the middle of the three lots and is bounded to the west by Meigs Street and to the east by an unpaved strip of land.
- AOC 3 (1.0 acre), also known as Parcel COD-7, is the easternmost lot and is bounded to the west by a strip of land and to the east by Keowee Street.
- AOC 4 is groundwater beneath the entire Property (COD-5, -6, and -7).

2.2 OTHER AREAS

Immediately to the north of the Property are other parcels that make up part of the former GM Delphi-Harrison Thermal Systems Facility. GM is addressing these areas with U.S. EPA through a Voluntary Performance Based Corrective Action under RCRA.

2.3 LOCATION AND PHYSIOGRAPHY

The Dayton area and Great Miami River Valley are located within the Central Glaciated Plains Physiographic Province of southwestern Ohio. The Great Miami River Valley is approximately 2.5 miles wide in the Dayton area and is bounded by bedrock highs and contains various glacial features. The upland regions are characterized by gently rolling topography developed on ground moraine, and the valley floor is relatively flat. The Property has an elevation of approximately 740 feet above mean sea level (MSL). The Mad River is located approximately 700 feet north of the Property. The confluence of the Great Miami River and Mad River is approximately 0.4 miles downstream of the GM facility. The Property is within the 500-year flood boundary, but the area is protected from the 500-year flood by an earthen levee dike.

2.4 SITE GEOLOGY

The Property is underlain by the Mad River Buried Valley Aquifer and is situated within the Mad River Watershed. The top 15 ft of soil at the Property consists mostly of sand and gravel with a thin silty clay layer from 5 to 6 ft below ground surface (bgs). The average depth to the shallow groundwater is 10 ft. According to the Current Conditions Report for the Former GM Delphi-Harrison Facility (Conestoga-Rovers & Associates, 2001), three hydrostratigraphic units have been identified in the area. The upper sand and gravel unit consists of an extensive deposit of coarse-grained sand and gravel with localized zones of medium-grained sand to boulders. The saturated thickness of the shallow water table is approximately 20 to 50 ft.

A till-rich unit separates the upper and lower sand and gravel. This unit generally consists of two till zones, brown silty clay with sand and gravel, and gray silty clay with sand and gravel. The lower sand and gravel unit is similar in lithology to the upper sand and gravel. According to United States Geological Survey (USGS) and Ohio Department of Natural Resources (ODNR) well records, the top of the bedrock in the vicinity of the Property is approximately 205 ft bgs. The local groundwater flows northwest with a gradient of 0.0009 feet per foot (ft/ft).

2.5 LAND USE

The Property is currently zoned as part of an Urban Business District and is used for public parking. The adjacent former GM facility is currently undergoing redevelopment by the City of Dayton. The Property will be part of the City of Dayton's Tech Town Redevelopment, which includes a concentration of offices and technology companies, support services, educational services, and a central park area in a campus-like environment.

2.6 GROUNDWATER USE

The City of Dayton supplies drinking water to the area surrounding the Property. No public drinking water system source areas are known to exist within a 1-mile radius of the former GM facility, and there are no unregistered users of groundwater as drinking water in the vicinity of the Property. The City of Dayton operates two upper aquifer dewatering pumps at the State Route 4 and Keowee Street underpass located north of the Property. The Improved Solutions for Urban Systems (ISUS) building operates one upper aquifer dewatering well at the southeast corner of Monument and Keowee Street.

The non-potable-use wells extracting groundwater from the lower aquifer in the vicinity of the Property include the geothermal well at the Patterson Career Academy, the fountain wells, and the irrigation well for the Dayton Dragons baseball field.

3. MEDIA CLEANUP STANDARDS

The proposed future use of the entire site (the Property and the former GM facility area to the north) is a campus-like setting for technology companies, support services, and educational services. The RFI presented a human health screening level risk evaluation (SLRE) of COPCs at the Property (WESTON, 2007). The following is a list of the risk goals and criteria used to develop the SLRE.

- Risk from COPCs in Soil
    - U.S. EPA Region 9 Preliminary Remediation Goal (PRG) for residential soil.
    - Risk management range for adverse cancer effects: 1×10^{-6} to 1×10^{-4}
    - Target Hazard Quotient (HQ) range of 0.1 to 1
- Risk from COPCs in Shallow Groundwater
    - U.S. EPA Region 9 PRG for tap water
    - Risk management range for adverse cancer effects: 1×10^{-6} to 1×10^{-4}
    - Target HQ range of 0.1 to 1

Because the Property is located in the inner-city, the RFI concluded that there was no potential unacceptable risk to flora and fauna. To determine which COPCs would need to be remediated, the RFI identified the following receptor populations for the Property.

- On-site –Routine workers, redevelopment/maintenance (construction) workers, trespassers, and future recreational visitors.
- Offsite – Routine workers, maintenance (construction) workers, and recreational visitors.

Based on the presence of COPCs resulting from historical activity on the Property and the risk they pose to human health and the environment, the RFI Risk Evaluation came to the following conclusions, which form the basis for determining appropriate corrective measures for the Property.

- The cancer and non-cancer risk associated with the exposure pathway of direct contact with soil is within the acceptable risk management range for the standards applied to the Property.
- The cancer and non-cancer risk associated with the exposure pathway of vapor intrusion of COPCs in soil to indoor air does not exceed the acceptable standards in AOC 1 and AOC 2.
- The cancer risk from the vapor intrusion of COPCs in soil to indoor air associated with AOC 3 will exceed the acceptable range if a building is built in this AOC in the future. The primary contributor to the risk is PCE detected at its highest concentration in a soil sample collected from boring location B-9 in the 0 to 5 ft bgs interval.
- Cancer and non-cancer risks associated with the vapor intrusion from groundwater to indoor air are within the acceptable risk management ranges.
- COPCs were detected in groundwater from the upper aquifer on and upgradient of the Property at concentrations exceeding MCLs. These COPCs are not considered to be Property related.
- There are no anticipated impacts to important ecological resources at the Property.

The RFI also documented the results of a geophysical study of the Property (Grumman, 2006). Significant geophysical anomalies were investigated by digging test pits, and one storage tank situated on a concrete floor in the burier remnants of a basement was discovered in the northeast area of AOC 3 (Parcel COD-7). The dimensions of the steel tank were approximately 6 ft by 2 ft by 4 ft. WESTON collected a sample of the sludge contained within the tank during the test-pit excavation. In addition to petroleum constituents (TPH fingerprint closely resembling kerosene and motor oil), the sludge contained lead at a concentration of 9,170 milligrams per kilogram (mg/kg).

Based upon the RFI and SLRE, the following remedial measures are required for the following:

- Mitigate vapor intrusion risk to indoor air should a building be placed in the vicinity of boring location B-9.
- Remove the UST located on COD-7 (AOC 3).
- Restrict use of the property and groundwater to ensure future use is consistent with the assumptions of the SLRE.

4. INTERIM CORRECTIVE MEASURES

Based upon the RFI and Environmental Indicators, current human exposures are under control. There is no concern that COPCs originating on the Property will migrate off-Property or that other existing conditions will change prior to implementation of corrective measures. The nature of the existing contamination poses no existing adverse unacceptable exposure to hazardous constituents and no imminent threat to human health or the environment.

4.1.1 Storage Tank Removal

On 22 May 2007, the City removed a buried storage tank from the northeast corner of AOC 3. The storage tank was identified as a subsurface anomaly during a geophysical study. The tank had approximate dimensions of 6 ft by 2 ft by 4 ft, and was situated on a concrete floor inside the remnants of a basement filled with demolition debris, sand, and gravel. Figure 5-3 presents the tank removal area. The tank was removed in accordance with the Ohio Bureau of Underground Storage Tank Regulations (BUSTR). The BUSTR closure report will be provided to U.S. EPA under separate cover once complete.

5. IDENTIFICATION AND DEVELOPMENT OF CORRECTIVE MEASURES

The SLRE performed as part of the RFI concluded that the only exposure concern within AOCs 1, 2, or 3 was from PCE found in the vadose zone soil at boring location B-9. Boring location B-9 is situated near the center of the northern half of AOC 3. A decommissioned truck scale is located next to this boring location.

OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (Final), dated May 1994, suggests "that a streamlined or highly focused CMS may be appropriate" at facilities that have limited on-site soil contamination or where remedial solutions are straightforward and standard engineering solutions are applicable. Based on the conclusions of the SLRE, a streamlined and focused approach is considered to be appropriate for this Property. Corrective-measure options need to be developed only for vapor intrusion of PCE from soil to indoor air in AOC 3. WESTON has identified other corrective measures that are being implemented to address general concerns at the Property that were identified during the RFI but did not pose an unacceptable risk in the SLRE.

5.1 CORRECTIVE MEASURE IDENTIFICATION

5.1.1 Soil Direct Contact – Sitewide

One of the goals of any corrective measure being considered is to ensure that future land use remains consistent with the risk management assumptions used in the RFI SLRE. The risk assumptions were evaluated using a future commercial/industrial land use scenario. The Property is part of the City's Tech Town Redevelopment, which is a planned campus-like environment for businesses; there will be no residential facilities on the Property. An institutional control will be included as part of all corrective-measure alternatives to prohibit uses of the land not compatible with the assumptions of the SLRE.

5.1.2 Vapor Intrusion from Soil to Indoor Air

Although the vapor intrusion risk from chemicals of concern present in B-9 was determined to be unacceptable, this pathway is presently incomplete because there are currently no structures on the

property within which vapors could migrate to indoor air. Therefore an institutional control can be used to mandate corrective measures be implemented prior to construction of any buildings in the referenced area of B-9.

The estimated area of contamination surrounding sample location B-9 is a 30-ft by 30-ft area. The estimated area of soil requiring remediation is 900 square feet (ft^2). The estimated depth of contamination is 5.5 feet bgs. This calculates to approximately 183 in-situ cubic yards (yd^3) of soil that require remedial measures to ensure occupants of future buildings are protected from risk associated with vapor intrusion into indoor air.

5.1.2.1 In-Situ Soil Vapor Extraction

Several in-situ treatment methods, both physical and chemical, that have the potential to remediate chlorinated solvents in soil. In-situ soil vapor extraction (SVE) is a technique for treating contaminated soil in place using extraction of air containing VOCs from the unsaturated zone. A vacuum system is used to extract VOC-laden air from the subsurface using vapor-extraction wells, resulting in a passive flow of clean air across the zone of contamination. Figure 5-1 shows a process schematic. The SVE system designed for AOC-3 would consist of two extraction wells in the soil area surrounding boring location B-9, and the piping would be located underground. The wells would be located within an underground vault to allow parking lot usage. The SVE system components would include wells, an air/water separator, and a vacuum pump or blower. WESTON does not expect that off-gas treatment would be required for the SVE system based on the contaminant concentrations present at the Property, although a General Permit To Install will have to be obtained from the Regional Air Pollution Control Agency. Sampling events will be required after the system is shut down to verify that clean-up has been achieved. Table 5-1 presents a cost estimate for this alternative.

Effectiveness

The SVE system is well suited for the high-permeability unsaturated sandy soil present at the Property. Its application would most likely reduce the concentration of PCE to an acceptable range. A pilot test is recommended to definitively confirm its effectiveness and to determine the radius of influence of the

wells. The technology is effective in both the short and long term and would adequately reduce the toxicity, mobility, and volume of the contamination. Long-term maintenance of the system is required.

Implementability

In situ SVE has been successfully used on soils contaminated with chlorinated solvents such as PCE. Further consideration would require a comprehensive investigation of the soil's physical and chemical parameters. Operation and maintenance (O&M) of the system would be required. Additional soil sampling would be required to determine when the PCE concentration has been reduced to the media cleanup standard and treatment could be stopped.

Cost

Construction costs, present worth of O&M costs, design, and other indirect costs were estimated at $258,000. Table 5-1 presents a cost estimate for this alternative.

SCHEDULE

Design of this remedy would require approximately 3 months with an additional 2 months for bench-scale testing. Bidding, procurement, and permitting would likely require 2 to3 months, and actual construction would likely require about 2 weeks. O&M of the SVE system would likely be required for 5 years, with quarterly sampling for the first year and semi-annual sampling for every year thereafter.

5.1.2.2 Excavation and Off-Site Disposal

Removal technologies involve conventional excavation procedures to remove contaminated materials from site areas. This technology is considered a corrective measure when performed in conjunction with the transport and disposal of contaminated soil to a licensed off-site facility. An estimated 220 yd^3 or 330 tons of soil would require excavation and off-site disposal. The estimated volume includes a factor of +15% to account for over-excavation and expansion of the excavated soil. The disposal weight was calculated assuming that 1 yd^3 of soil is equivalent to 1.5 tons. Actual

dimensions may vary with further delineation prior to or during excavation. Confirmation samples would be collected from the excavation bottom (three total) and sidewalls (four total) and analyzed for PCE after completing the excavation. The excavation area would be backfilled with clean soil and restored to original conditions pending confirmation sampling analytical results. Figure 5-2 presents the approximate area to be excavated.

Effectiveness

This technology is effective in overall protection of human health and the environment in both the short and long term because the source of contamination would be removed to cleanup levels. Removal and off-site disposal of the contaminated soil would also prevent impact to natural resources by eliminating the possibility of lateral migration of contaminated soil to downgradient areas. Excavation of the contaminated soils also eliminates the potential that soil contaminants will migrate downward into the underlying aquifer.

This alternative removes contaminated soil from the Property; it does not reduce the volume, mobility, or toxicity of the contaminants. It simply transfers the contaminants from the area of contamination to an off-site location.

Off-site transport of contaminated soil must comply with applicable transportation requirements. There is a low risk of a release of contamination from a traffic accident during transport. Short-term risks would be posed to the surrounding community and the on-site workers due to dust inhalation and ingestion; however, particulate emissions could be minimized using dust suppression measures. Additional short-term risks would be posed due to vehicular traffic for both hauling the contaminated soil to a landfill as well as delivery of the backfill to the Property.

Implementability

Excavation can be accomplished with commonly used construction equipment and techniques. If excavated soil is stockpiled on the Property, a surface barrier and proper covering with plastic sheeting would be required until the soil was loaded and transported off-site for disposal. Alternatively, excavated soils could be placed in roll-off containers and covered until transport.

If fugitive dust emissions are a problem during excavation, dust-suppression measures are readily available and easily implemented. Overall, Property restoration would be simple.

Cost

Construction costs, design, and other indirect costs were estimated at $125,000. Table 5-2 presents a cost estimate for this alternative.

SCHEDULE

Design of this remedy would require approximately two weeks. Bidding, procurement, and permitting would likely require 2 to 3 months, and actual construction would likely require about one week.

5.1.2.3 Vapor Migration Barrier and Venting System

Vapor migration controls are used to prevent or minimize the potential for air to infiltrate from the subsurface into a structure through cracks and joints in the foundation and via gaps around utility lines and pipes. These controls are designed to create a preferential pathway for gas beneath the slab of the building to migrate laterally beyond the building footprint. Engineered design of a vapor migration barrier would be included in the building construction phase. The vapor migration barrier will underlie the building slab and include vent piping installed within a gas-permeable layer such as clean gravel overlain by an impermeable barrier (e.g. geomembrane). Sealant is applied around all penetrations, such as utility lines. A vacuum system, or if deemed acceptable, passive ventilation, is used to remove vapor accumulating in the gravel beneath the impermeable barrier through external vents. Costs associated with a vapor migration barrier and venting depend on the construction specifications and size of the building. Because there are no current design plans for a building in this area, cost cannot be accurately quantified. Table 5-3 presents a cost estimate for this alternative assuming a 15,000 square foot building footprint.

Effectiveness

Vapor migration barrier technology can be effective when properly installed and maintained. Challenges include preventing breaches to the impermeable liner and maintaining seals around utility lines and other penetrations.

Implementability

Vapor migration barrier technology has been successfully used on soils contaminated with chlorinated solvents such as PCE. The impermeable barrier must be of sufficiently durable to withstand wear during construction. Care must be taken to ensure the barrier is not punctured, and any necessary breaches occurring during maintenance and repair of the building are repaired. Tests such as pressure tests, smoke tests, and/or post-construction indoor-air tests can be used to assess the efficacy of the barrier so that any breaches can be identified and necessary repairs made.

Cost

Construction costs, design, operation and other indirect costs were estimated at $277,355. Table 5-3 presents a cost estimate for this alternative.

SCHEDULE

Design of this remedy, bidding, and procurement would occur concurrent with the building design, bidding, and procurement effort. Actual construction would likely require about 2 weeks. O&M of the vapor migration barrier and venting system would be required for the life of the building or until contamination levels are reduced to acceptable risk levels. The Table 5-3 cost estimate includes biannual air monitoring for the first year of operation followed by annual air monitoring for years 2 through 5.

5.1.2.4 Recommendation

PCE contamination was detected within the 0 to 5 ft bgs interval at only one location in AOC 3. It was not detected in any of seven other surface soil samples taken in AOC 3. The apparent localized nature of this sole contaminant suggests that implementing a corrective measure that includes any type of physical or chemical treatment system would not be an efficient use of resources. The existing condition at this location is better suited to a remedy that includes excavation of soil within a limited area of boring locations B-9, verification sampling and analysis, and proper disposal of the excavated soils. This remedial measure is warranted prior to construction of any structures in the vicinity of B-9 within COD-7.

5.1.3 Groundwater Use – Sitewide

The RFI found that the upper aquifer underlying the Property contains elevated concentrations of TCE. WESTON determined that the source of the TCE is not within the boundary of the Property and thus the City is not required to implement a corrective measure to restore the aquifer. Nevertheless, the contamination of the upper aquifer still exists and must be considered. In order to protect human health from unacceptable risk associated with use of the aquifer, it is recommended that an Environmental Covenant be placed on the Property deed to restrict future uses of the aquifer. This Environmental Covenant would prohibit potable use of the aquifer and thus provide for long-term protection of human health.

6. RECOMMENDATION FOR FINAL CORRECTIVE MEASURE ALTERNATIVE

The final corrective measure alternative that is recommended for the Property is the following:

- Excavate and dispose of soil with PCE concentrations exceeding a PCE cleanup-standard of 550 ug/kg within the vicinity of boring B9 in AOC 3. Perform sampling and analysis to confirm that the contaminated soil has been removed to the established clean-up standards.
- Place an Environmental Covenant on the Property restricting the use of groundwater.
- Placing an Environmental Covenant on the Property restricting future land use to commercial or industrial.

7. REFERENCES

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TABLES

Table 5-1
Detailed Cost Evaluation
Soil Vapor Extraction
Three General Motors Former Parking Lots
Dayton, Ohio

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT CAPITAL COSTS						
BONDS AND INSURANCE	1	LS	$1,500	$1,500		Payment, Performance Bond and Insurance. Approximately 5% of total Capital Co
					$1,500	
MOBILIZATION/DEMOBILIZATION	1	LS	$2,000	$2,000		Mob/Demob of heavy equipmen
					$2,000	
SITE PREPARATION						
Asphalt Removal	90	SY	$40	$3,600		Assume 2, 8-inch hole for extraction wells and trench (30ft long, 3ft deep and 3ft wide). Assume 6" thick asphalt with 6" subbase.
Environmental Control	1	LS	$500	$500		Includes Air Monitoring , Erosion Controls, and Dust Suppression
Permitting	1	LS	$1,000	$1,000		
					$5,100	
VAPOR EXTRACTION WELL						
Materials (SVE Well)						Assume 3 days for well installation including drilling and hooking up the wells with the SVE syste
Drilling	10	LF	$30	$300		
Casing	10	LF	$20	$200		
Screen	5	LF	$40	$200		
Filter Pack	5	LF	$10	$50		
Bentonite Seal	5	LF	$12	$60		
Wellhead/Gauges	1	EA	$200	$200		
Cement Pad/Cover	1	EA	$300	$300		
55 Gal Drum Disposal	5	EA	$200	$1,000		
Number of SVE Well	2					
					$4,700	
SOIL VAPOR EXTRACTION SYSTEM						Assume Skid Mounted SVE Systen
Vapor Extraction System	1	LS	$6,825	$6,825		
Steel Framed Enclosure	1	EA	$4,500	$4,500		Assume air treatment is not require
Trench for piping	30	LF	$5	$150		Assume 3ft wide and 3 ft deep trench with backfill. Assume excavated material to be placed back in the trencl
Piping in trench	30	LF	$3	$90		2" PVC, SCH 40
Pipe Fitting	2	EA	$45	$90		2- 90 degree elbow
Electric Control Panel	1	EA	$3,750	$3,750		
					$15,500	
DIRECT COST SUBTOTAL					$28,800	
INDIRECT COSTS						
ENGINEERING /DESIGN						
Engineering and Design	1	LS	$5,000	$5,000		Assume 15% of total capital cost
Pilot Study	1	LS	$3,000	$3,000		Includes the cost of renting the equipment and energy (gas) required for the test. Assume that the test can be completed in a day. One of th extraction wells mentioned above could be used for the stud
					$8,000	
CONTRACTOR PROCUREMENTS		-	-	$1,000		
					$1,000	
CONSTRUCTION MANAGEMENT						
Engineer	100	Hour	$125	$12,500		Assumes 2 weeks @ 10 hrs/day for SVE system including extraction we
Per Diem (Engineer)	10	Day	$120	$1,200		Includes meals and hotel
Geologist	30	Hour	$90	$2,700		Assume Geologist on site during drilling and well installatio
Per Diem (Geologist)	3	Day	$120	$360		
Car Rental	17	Day	$65	$1,105		Assume 2 vehicles (1 Vehicle for 14 days and the other for 3 days). Rate is based on truck ($75/day) + $20/day fuel
Admin/Office Support		-		$2,500		10% of construction management labor
Health & Safety Monitoring	10	Day	$500	$5,000		Required during drilling and well installatio
					$25,400	
CONSTRUCTION MANAGEMENT - HOME OFFICE SUPPORT						
Project Manager	12	Hour	$200	$2,400		Assume 6 hours for project opening and 6 hours for project closeout
Project Administration	4	Hour	$80	$320		Assume 4 hours for subcontractor procurement
					$2,700	
INDIRECT COST SUBTOTAL					$37,000	

Table 5-1
Detailed Cost Evaluation
Soil Vapor Extraction
Three General Motors Former Parking Lots
Dayton, Ohio

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
OPERATIONS AND MAINTENANCE (O&M) COSTS						
YEAR 1						
QUARTERLY AIR MONITORING & SYSTEM MAINTENANCE						
Labor	40	Hour	$80	$3,200		Assume 1 Personnel at 10 hours/day for 1 day quarterly
Per Diem	4	Day	$120	$960		Includes meals and hotel
PPE	4	LS	$100	$400		Includes expendable supplies
Equipment	4	Day	$500	$2,000		
Rental Vehicle	4	Day	$65	$260		
Shipping and packing materials	4	Coolers	$50	$200		
Sample Analysis	24	Samples	$90	$2,160		Assume 5 samples plus 1 duplicate per event
Monitoring Well & SVE System Maintenance/Repair	4	Event	$100	$400		Assume maintenance, repair and other pertinent work related to the treatment system to be carried during the sampling event
Electricity	35,000	KWHr	$0.10	$3,500		Assume 5 HP blower running 24 hours a day for a year
Reporting	4	Event	$500	$2,000		
ANNUAL O&M COST YEAR 1 SUBTOTAL					$15,100	
YEARS 2 THROUGH 5						
BIANNUAL AIR MONITORING & SYSTEM MAINTENANCE						
Labor	80	Hour	$80	$6,400		Assume 1 Personnel at 10 hours/day for 1 day biannually
Per Diem	8	Day	$120	$1,920		
PPE	8	LS	$100	$800		
Equipment	8	Day	$500	$4,000		
Rental Vehicle	8	Day	$65	$520		
Shipping and packing materials	8	Coolers	$50	$400		
Sample Analysis	48	Samples	$90	$4,320		Assume 5 samples plus 1 duplicate per event
Monitoring Well & SVE System Maintenance/Repair	8	Event	$100	$800		
Electricity	140,000	KWHr	$0.10	$14,000		Assume 5 HP blower running 24 hours a day for 4 years
Reporting	8	Event	$500	$4,000		
					$37,200	
CONFIRMATION SOIL SAMPLING AT THE END OF 5th YEAR						
Labor	10	Hour	$80	$800		Assume 1 Personnel for 10 hours/day for 1 day.
Per Diem	1	Day	$120	$240		
Equipment and supplies	1	LS	$1,000	$1,000		Includes the cost of drilling (10ft) and expendable supplie
Rental Vehicle	1	Day	$65	$65		Assume 1 vehicle
Shipping and packing materials	1	Event	$150	$150		
Sample Analysis	4	Sample	$90	$360		Assume 4 samples including one duplicate
Reporting	1	Event	$500	$500		
					$3,200	
ANNUAL O&M COST YEARS 2 THROUGH 5 SUBTOTAL					$40,400	
ANNUAL O&M COST YEARS 1 THROUGH 5 SUBTOTAL					$55,500	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$65,800	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$82,000	
SUB-TOTAL of ANNUAL O&M COSTS DURING YEAR 1 WITH 25% CONTINGENCY					$19,000	
SUB-TOTAL of ANNUAL O&M COSTS DURING YEARS 2 THROUGH 5 WITH 25% CONTINGENCY					$51,000	
PRESENT WORTH of ANNUAL O&M COSTS WITH CONTINGENCY					$176,000	Assumes an interest factor of 5.875 % and an O&M period of 5 years
TOTAL COST (DIRECT CAPITAL COSTS + INDIRECT COSTS + PRESENT WORTH COSTS) WITH					$258,000	

Table 5-2
Detailed Cost Evaluation
Excavation and Offsite Disposal
Three General Motors Former Parking Lots
Dayton, Ohio

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT CAPITAL COSTS						
BONDS	1	LS	$5,250	$5,250	$5,250	Payment, Performance Bond and Insurance. Approximately 5% of total Capital Co
MOBILIZATION/DEMOBILIZATION	1	LS	$2,000	$2,000	$2,000	Mob/Demob of heavy equipmen
SITE PREPARATION						
Surveying	1,200	SY	$2.5	$3,000		Assume and estimated 100'x100' area to be surveyed for utilities and property lines
Asphalt Removal	275	SY	$40	$11,000		Assume 50'x50' lot, Assume 6" thick asphalt with 6" subbase.
Environmental Contro	1	LS	$1,500	$1,500		Includes Air Monitoring , Erosion Controls, and Dust Suppression
					$15,500	
EXCAVATION OF SOIL						
Sheeting, shoring, bracing	1	LS	$5,000	$5,000		
Excavation	220	CY	$12	$2,640		30' by 30' area to a depth of 5 feet. Includes +15% factor for expansion
Waste Characterization	1	LS	$2,000	$2,000		Assumes one 5-point composite sample of excavated materia
					$7,640	
CONFIRMATION SAMPLING						
Supplies and Shipping	1	LS	$2,000	$2,000		Includes sampling supplies and health and safety equipmen
VOCs (PCE)	9	Sample	$100	$900		Assume 5 floor samples and 4 sidewall samples. Includes sample shipmen
					$2,900	
BACKFILLING						
Backfill	220	CY	$25	$5,500		Includes labor, equipment, materials, and delivery (20 mile round trip)
Sampling	1	LS	$1,500	$1,500		Assumes 1 sample of the borrow source for VOCs, SVOCs, Pesticides, PCBs, and metals
					$7,000	
OFF-SITE DISPOSAL						
Transport - Concrete and/or asphalt	200	Ton	$10	$2,000		Assumes 2.25 tons/CY of a 50' by 50' area and depth of 12 inches
Disposal - Concrete and/or asphalt	200	Ton	$25	$5,000		
Soil Transport to Landfil	330	Ton	$10	$3,300		Includes transportation and delivery to landfill. Volume of approximate 220 CY or 330 Tons. Assumes 1.5 tons/CY.
Soil Disposal	330	Ton	$25	$8,250		
					$18,550	
SITE RESTORATION						
Asphalt Repavement	275	SY	$30	$8,250		Includes material, equipment, labor, placement, and compactior
Equipment Decontaminatior	1	LS	$1,500	$1,500		
					$9,750	
DIRECT COST SUBTOTAL					$69,000	
INDIRECT COSTS						
ENGINEERING/DESIGN/INVESTIGATION						
Engineering and Design	1	LS	$10,500	$10,500		Assume 15% of total capital cos
Deed Restriction Drafting and Implementatior	1	LS	$2,000	$2,000		
					$12,500	
CONTRACTOR PROCUREMENTS		-	-	$1,500		Assume 2% of direct costs
					$1,500	
CONSTRUCTION MANAGEMENT						
Resident Engineer	50	Hour	$100	$5,000		Assumes one person at site for 1 work week, 10 hours/da
Per Diem	5	Day	$120	$600		Includes meals and hotel
Car Rental	5	Day	$65	$325		Assume 1 vehicle for one week
H&S and Sampling Equipment	5	Day	$500	$2,500		One week
Admin/Office Support	-	-	-	$1,500		10% of construction management labor
Post-Construction Documentation and Certificatior	1	LS	$5,000	$5,000		
					$14,900	
CONSTRUCTION MANAGEMENT - HOME OFFICE SUPPORT						
Project Manager	12	Hour	$125	$1,500		Assume 6 hours for project opening and 6 hours for project closeou
Project Administratior	4	Hour	$65	$260		Assume 4 hours for subcontractor procuremen
					$1,800	
INDIRECT COST SUBTOTAL					$31,000	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$100,000	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$125,000	

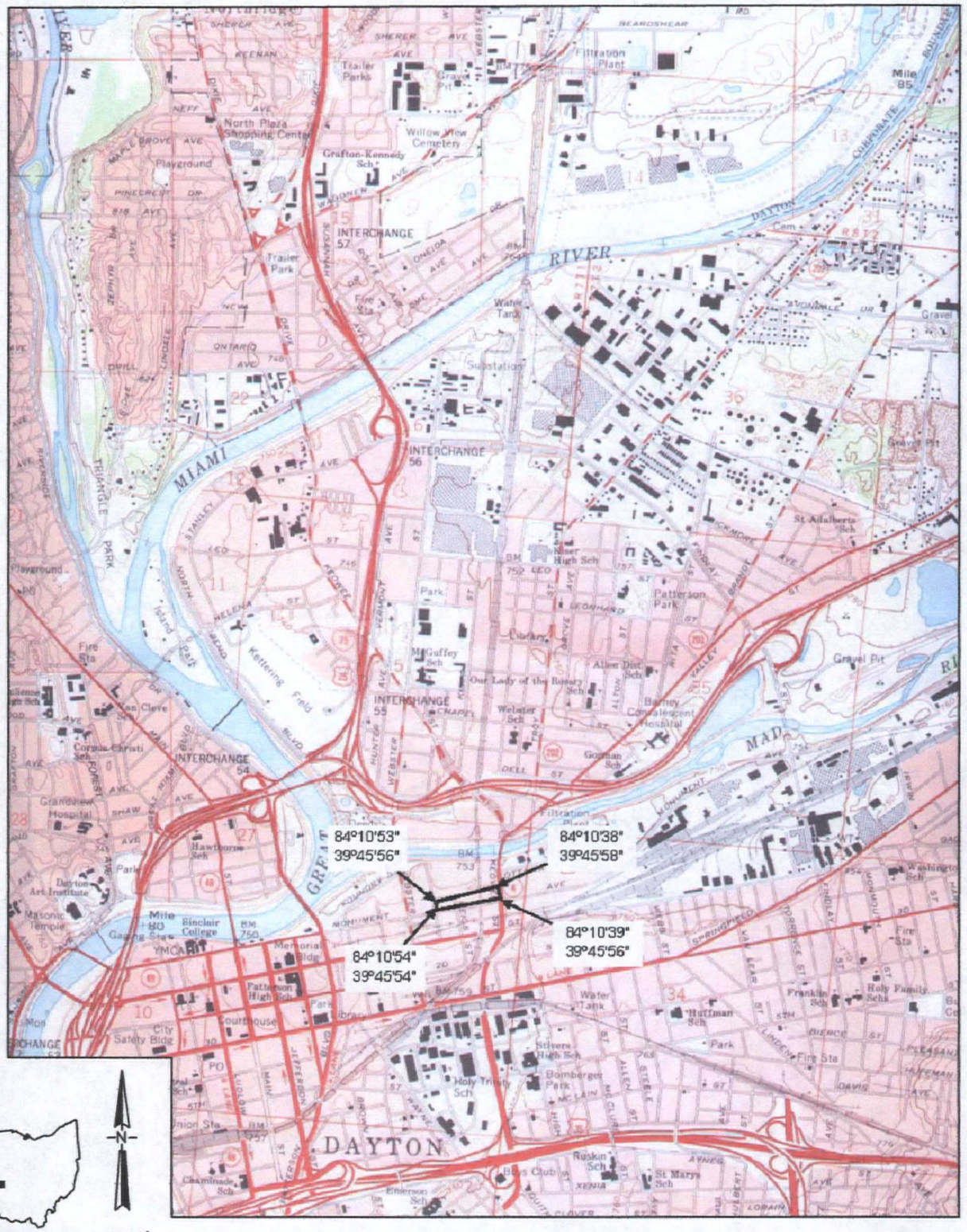
Table 5-3
Detailed Cost Evaluation
Vapor Migration Barrier and Venting System
Three General Motors Former Parking Lots
Dayton, Ohio

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
DIRECT CAPITAL COSTS						
MOBILIZATION/DEMOBILIZATION	1	LS	$2,000	$2,000	$2,000	Mob/Demob of subcontractor concurrent with building construction
VAPOR MIGRATION SYSTEM						
Vapor Barrier	15000	SQ FT	$4.50	$67,500	$67,500	Includes GeoVent, 60 mils Liquid Boot, and Ultrashield Course. Assumes aggregate included in the building construction design.
DIRECT COST SUBTOTAL					$69,500	
INDIRECT COSTS						
ENGINEERING /DESIGN						
Engineering and Design	1	LS	$6,950	$6,950	$7,000	Assume 10% of total capital cost
CONTRACTOR PROCUREMENTS		-	-	$1,000	$1,000	
CONSTRUCTION MANAGEMENT						
Engineer	50	Hour	$125	$6,250		Assumes 1 week @ 10 hrs/day for vapor migration system
Per Diem (Engineer)	5	Day	$120	$600		Includes meals and hotel.
Car Rental	5	Day	$95	$475		Assume 1 vehicle for 5 day . Rate is based on truck ($75/day) + $20/day fue
Admin/Office Support		-		$935		10% of construction management labor.
Health & Safety Monitoring	5	Day	$500	$2,500	$10,800	Required during drilling and well installatio
CONSTRUCTION MANAGEMENT - HOME OFFICE SUPPORT						
Project Manager	12	Hour	$200	$2,400		Assume 6 hours for project opening and 6 hours for project closeout
Project Administration	4	Hour	$80	$320	$2,700	Assume 4 hours for subcontractor procurement
INDIRECT COST SUBTOTAL					$22,000	
OPERATIONS AND MAINTENANCE (O&M) COSTS						
YEAR 1						
BIANNUAL PERFORMANCE TESTING (AIR MONITORING) & OPERATING COSTS						
Labor	12	Hour	$80	$960		Assume 1 Personnel at 6 hours/day for 2 days per year (2 events).
Per Diem	2	Day	$120	$480		Includes meals and hotel.
Equipment	2	Day	$150	$300		
Rental Vehicle	2	Day	$65	$130		
Shipping and packing materials	2	Containers	$50	$100		
Sample Analysis	10	Samples	$275	$2,750		Assume 4 samples plus 1 duplicate per event
Electricity	35,000	KWHr	$0.10	$3,500	$8,300	Assume 5 HP max blower running 24 hours a day for a year
ANNUAL O&M COST YEAR 1 SUBTOTAL						

Table 5-3
Detailed Cost Evaluation
Vapor Migration Barrier and Venting System
Three General Motors Former Parking Lots
Dayton, Ohio

	ENGINEER'S ESTIMATES					COMMENTS
	Quantity	Unit	Unit Price	Cost	Subtotal	
YEARS 2 THROUGH 5						
ANNUAL AIR MONITORING & OPERATING COSTS						
Labor	24	Hour	$80	$1,920		Assume 1 Personnel at 6 hours/day for 1 day per year.
Per Diem	4	Day	$120	$960		Includes meals and hotel.
Equipment	4	Day	$150	$600		
Rental Vehicle	4	Day	$65	$260		
Shipping and packing materials	4	Container	$50	$200		
Sample Analysis	20	Samples	$275	$5,500		Assume 4 samples plus 1 duplicate per event
Electricity	140,000	KWHr	$0.10	$14,000		Assume 5 HP max blower running 24 hours a day for 4 years
ANNUAL O&M COST YEARS 2 THROUGH 5 SUBTOTAL					$23,500	
YEARS 5 THROUGH 20						
OPERATING COSTS						
Electricity	525,000	KWHr	$0.10	$52,500		Assume 5 HP max blower running 24 hours a day for 15 years
ANNUAL O&M COST YEARS 2 THROUGH 5 SUBTOTAL					$52,500	
ANNUAL O&M COST YEARS 1 THROUGH 20 SUBTOTAL					$84,300	
SUB-TOTAL of DIRECT AND INDIRECT COSTS					$91,500	
SUB-TOTAL of DIRECT AND INDIRECT COSTS WITH 25% CONTINGENCY					$114,375	
SUB-TOTAL of ANNUAL O&M COSTS DURING YEAR 1 WITH 25% CONTINGENCY					$10,375	
SUB-TOTAL of ANNUAL O&M COSTS DURING YEARS 2 THROUGH 5 WITH 25% CONTINGENCY					$29,375	
SUB-TOTAL of ANNUAL O&M COSTS DURING YEARS 6 THROUGH 20 WITH 25% CONTINGENCY					$65,625	
PRESENT WORTH of ANNUAL O&M COSTS WITH CONTINGENCY					$162,980	Assumes an interest factor of 5.875 % and an O&M period of 20 years.
TOTAL COST (DIRECT CAPITAL COSTS + INDIRECT COSTS + PRESENT WORTH COSTS) WITH					$277,355	

FIGURES



SOURCE: U.S.G.S. 7.5 MINUTE TOPOGRAPHIC MAPS.
BLUE ISLAND, ILLINOIS QUADRANGLE.

FIGURE 1–1

WESTON SOLUTIONS

750 E. Bunker Ct.
Suite 500
Vernon Hills, Illinois
60061

SITE LOCATION MAP

FORMER GM PARKING LOTS

Dayton, Ohio

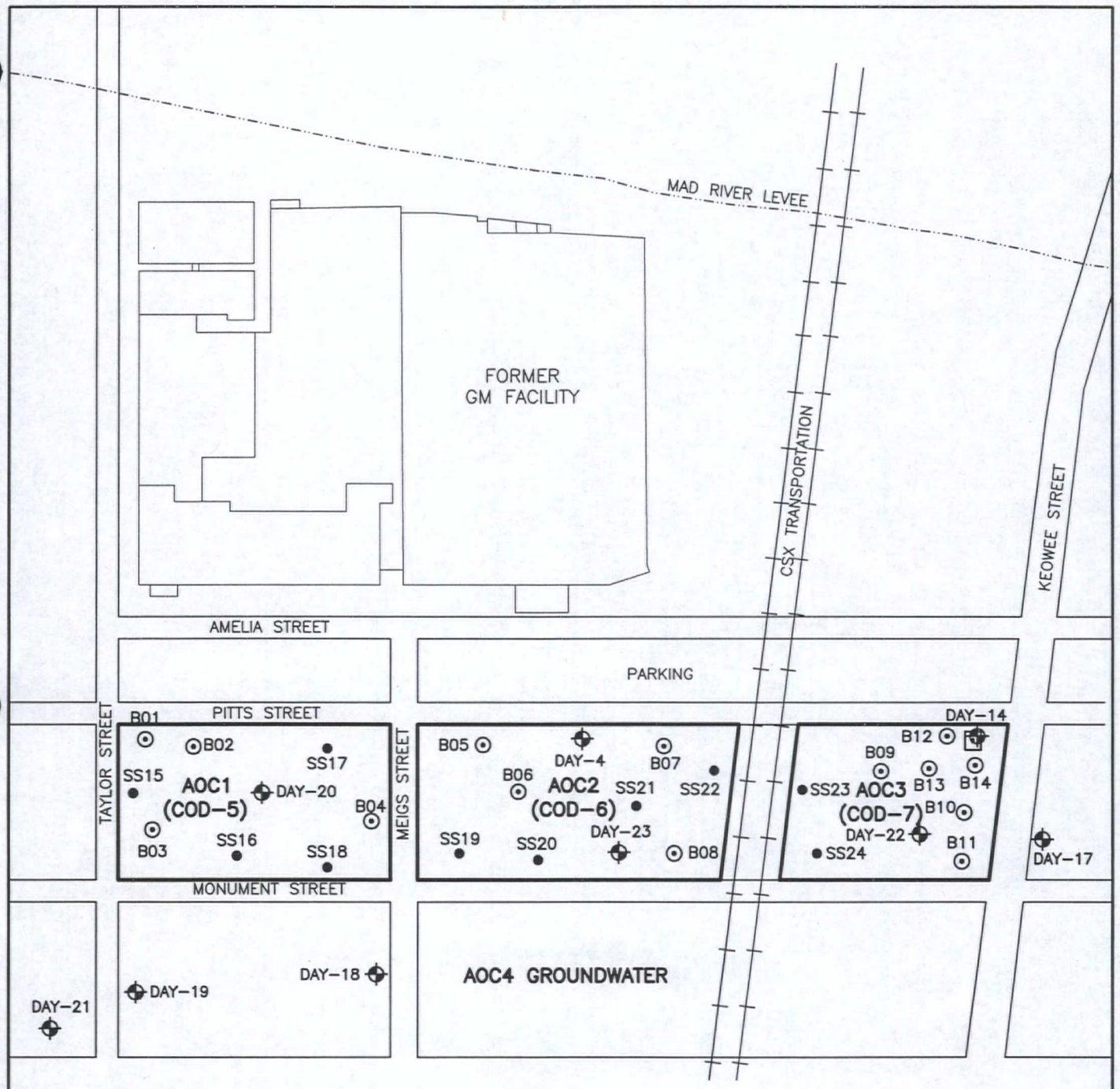


FIGURE 2-1

WESTON SOLUTIONS

2566 Kohnle Drive
Miamisburg, Ohio
45342

SOIL BORING AND SURFACE SAMPLE LOCATIONS AND EXISTING MONITORING WELLS
FORMER GM PARKING LOTS
Dayton, Ohio

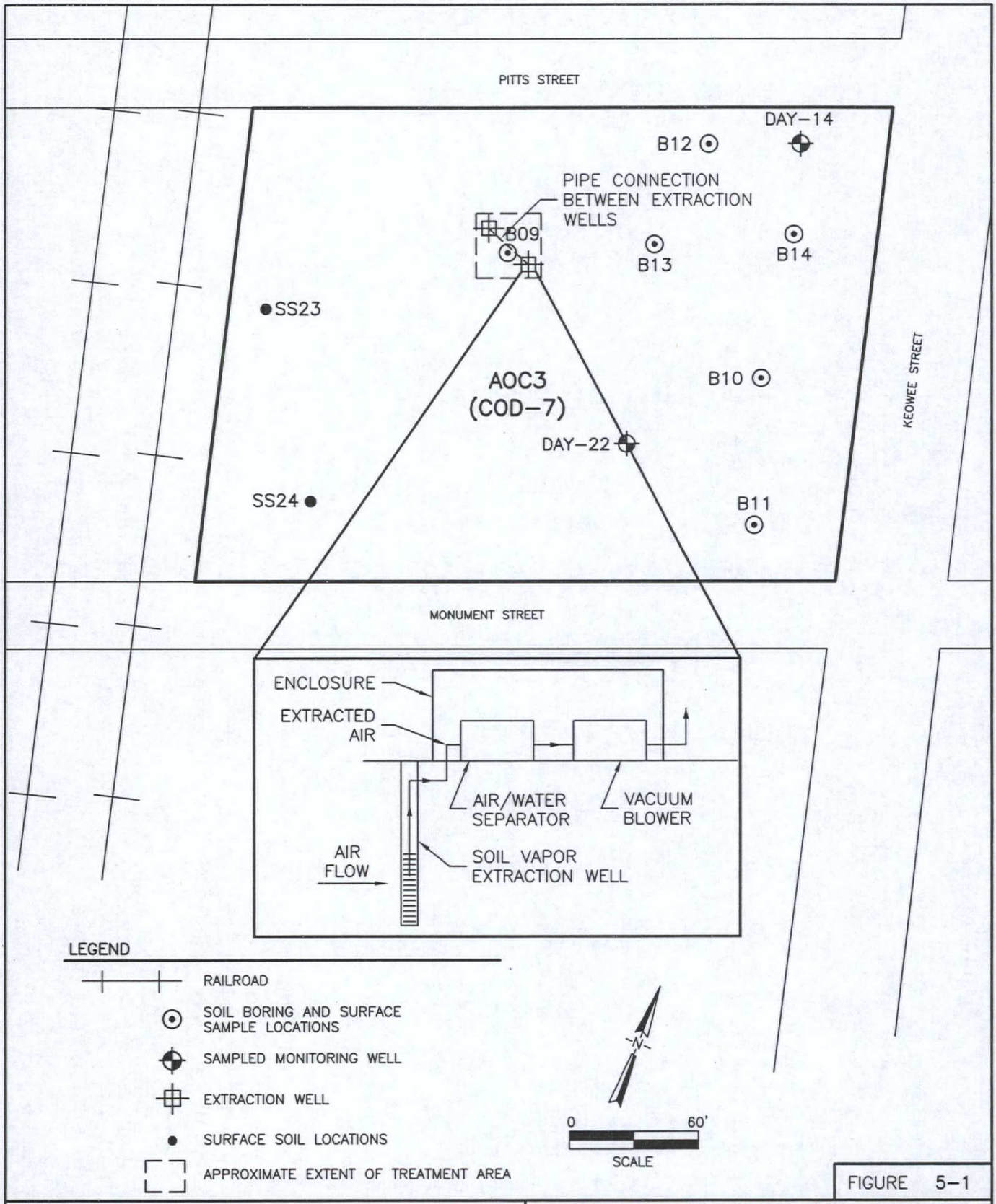


FIGURE 5-1

WESTON SOLUTIONS

2566 Kohnle Drive
Miamisburg, Ohio
45342

IN SITU SOIL VAPOR EXTRACTION ALTERNATIVE

FORMER GM PARKING LOTS

Dayton, Ohio

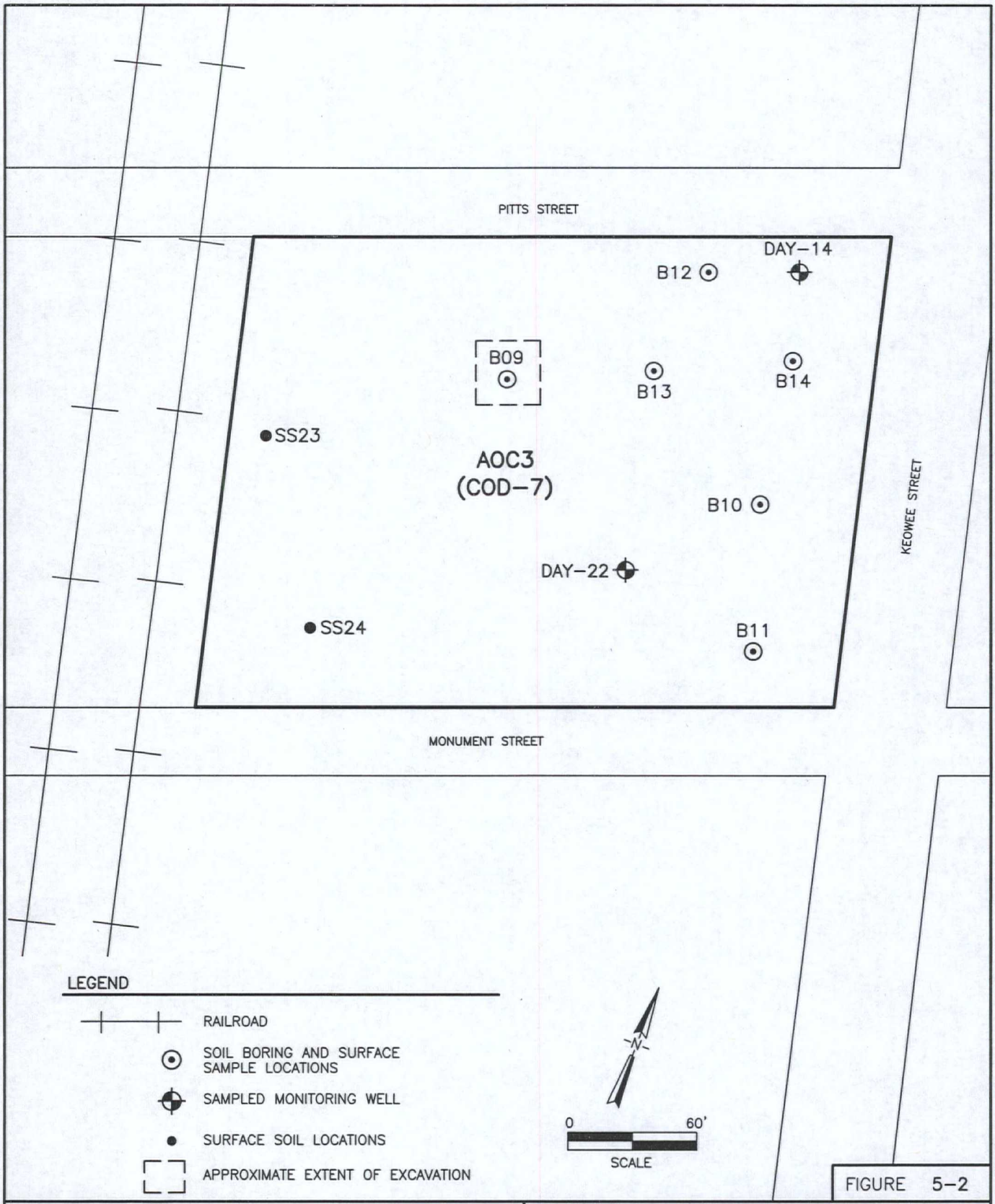


FIGURE 5-2

WESTON SOLUTIONS

2566 Kohnle Drive
Miamisburg, Ohio
45342

EXCAVATE AND DISPOSAL ALTERNATIVE

FORMER GM PARKING LOTS

Dayton, Ohio

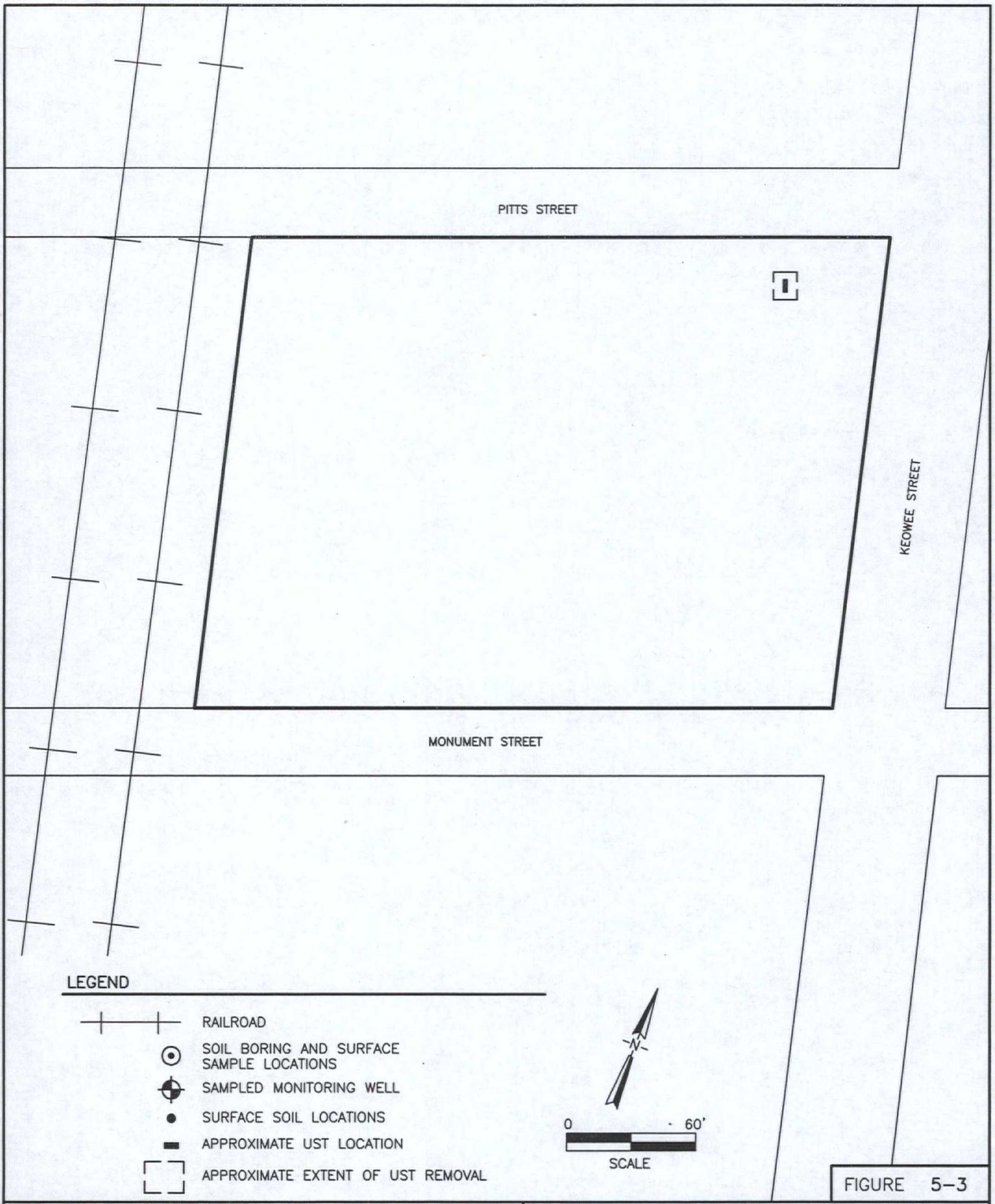


FIGURE 5-3

WESTON SOLUTIONS

2566 Kohnle Drive
Miamisburg, Ohio
45342

UST REMOVAL

FORMER GM PARKING LOTS

Dayton, Ohio